CHBE/MSNE 560
Spring 2018
Colloid and Interfacial Phenomena

Course objective: This course explains the fundamental principles related to interactions, dynamics, and structure in colloidal and soft matter systems. Concepts covered include hydrodynamics, Brownian motion, diffusion, sedimentation, electrophoresis, colloidal and surface forces, polymeric forces, aggregation, deposition, and experimental methods. Modern topics related to colloids in science and technology will be discussed.

You will be able to develop theoretical description of colloids and soft matter, their physics and physical chemistry, and apply these concepts to a variety of problems involving the quantitative description of interfacial phenomena. Additional objectives involve knowledge about the characterization of properties and structure-property relationships of different types of colloidal systems, the thermodynamic and physical principles governing colloidal assembly and phase behavior.

Instructor: Prof. Sibani Lisa Biswal
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GRB E207
Office Hours: Mondays 3pm-5pm (usually)

Textbook: An Introduction to Interfaces and Colloids: The Bridge to Nanoscience

Grading:
Homework: 35% of the grade (approximately 5-6 problem sets)
Project: 35% of the grade
Midterm exam: 30% of the grade

Honor Code:
Academic dishonesty will not be tolerated. Failure to comply with the University's policy will result in a "zero" in the assignment and an "F" in the course: http://honor.rice.edu/index.cfm

Web Page:
Canvas

DISABILITY:
If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with your advisor to discuss your accommodation needs.

Course Topics:

1) Describe the effect of surface forces (surface tension) on such phenomena as capillary rise and vapor pressure
2) Determine what structures result in molecules that are attracted to the interfacial regions. Be able to calculate their concentration and their effect of surface tension.
3) Describe the association phenomena of surface-active materials such as micellization and adsorption.
4) Describe the major forces between colloidal particles, both attractive and repulsive. Be able to calculate the effect of these forces on flocculation/coagulation processes.
5) Understand how to use laboratory apparatus to measure colloidal properties including surface tension, surface pressure vs. surface area relationships, particle size distribution, zeta potential and viscosity.
6) Insights into current problems of interest in colloidal phenomena.